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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/511,912	02/23/2000	Tatau Nishinaga	JEL 31015	4100

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EXAMINER

ANDERSON, MATTHEW A

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 03/26/2002

12

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/511,912	NISHINAGA, TATAU	
	Examiner	Art Unit	
	Matthew A. Anderson	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 March 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6 and 11-17 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6 and 11-17 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 February 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>11</u> . | 6) <input type="checkbox"/> Other: |

DETAILED ACTION

1. Claims 7-10 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected Species B, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in Paper No. 8.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-6, 11-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Davis et al. (US 6,051,849) in view of Tokunaga et al. (US 5,425,808) and Nakamura et al. (JP 01-234389A).

Davis et al. discloses a method for the growth of GaN (gallium nitride, a known III-V semiconductor compound) by masking a underlying GaN layer. The GaN layer is can be laterally overgrown the patterned array in the mask . MOVPE is given as the method used. The grown layer is a continuous monocrystalline layer (col. 2 lines 55-60). The Defect density obtained is less than 10^4 cm^{-2} . (col. 4 lines 20-30) GaN alloys can be formed form inclusions of Indium (In) or Aluminum (Al). (col. 5 lines 5-11). It is

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understood to those of ordinary skill in the art that these alloys will have different lattice constants depending on the degree of inclusion of other metals in the structure. The substrate used was SiC with AlN and GaN grown epitaxially thereon. Other substrates may be used (col. 4 lines 50-52). The upper layer of the substrate was the GaN layer. On this was grown a silicon dioxide mask which is patterned. The underlying GaN layer is then used as a base on which GaN is then grown in such a way as to fill the pattern and then overgrow the mask.

Davis et al. differs from Tokanaga et al. in that it does not require the SiO₂ mask be amorphous.

Tokanaga et al. discloses prior art in which GaAs (a known III-V semiconductor compound) is laterally overgrown on an amorphous SiO₂ or Si₃N₄ film. (col. 2 lines 14-29). Tokanaga et al. suggests the equivalence of MBE (molecular beam epitaxy) and CVD (chemical vapor deposition for growth of epitaxial films. (col. 1 lines 30-35, and col. 7 lines 15-24. Additionally, the use of such method to grow other III-V compounds (such as GaN) was also suggested.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to combine the references above because Tokanaga et al. suggests an equivalent method of forming selective epitaxial films upon amorphous masking layers.

The above combination does not teach the angle of incidence required by the claims.

Nakamura et al. discloses a molecular ray method of performing epitaxy with Ga, Al, and As. Nakamura et al. discloses optimization of the angle of incidence between the substrate and the molecular ray (i.e. beam). The angle can be optimized between 0-90 degrees.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to combine Nakamura et al. with the previous combination because Nakamura et al. discloses optimization of the angle of incidence between the substrate and the molecular ray (i.e. beam) in order to affect the product.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to optimize the incident angle between the substrate surface and the beam during lateral overgrowth of a single crystalline film on a patterned insulating amorphous film which lies on a single crystalline substrate from the exposed seed substrate because such is suggested by the combination of references, such optimization would have been achieved with only routine experimentation, and such optimization would have anticipated results.

In regard to claim 11, it would have been obvious to one of ordinary skill in the art at the time of the present invention to form linear openings in the amorphous film of a certain width because these limitations would have been obvious design choices based on Davis' figures, the orientation of the striped mask along a $\langle 11-20 \rangle$ direction, and 3 μ m openings (col. 6 lines 39-45) in that mask.

In regard to claim 14, it would have been obvious to one of ordinary skill in the art at the time of the present invention to form a single crystalline film with a defect

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density not more than 10^4 cm^{-2} because such is directly suggested in Davis et al. as possible with such an overgrowth method.

In regard to claims 15-16, it would have been obvious to one of ordinary skill in the art at the time of the present invention to grow films with lattice constants different from the substrate because Davis et al. suggests GaN alloys (which have an inherent lattice constant) can be grown on GaN substrates which have an inherent distinct lattice constant.

In regard to claim 17, it would have been obvious to one of ordinary skill in the art at the time of the present invention that the single crystalline substrate be of a material different than that of the beam used because Davis used a SiC single crystalline substrate with a top underlayer of GaN and grew GaN or a alloy of GaN (see col. 5 lines 5-10, col. 1 lines 40-45) thereon by ELO. Thus, the substrate material and the beam material may be different according to Davis.

Response to Arguments

4. Applicant's arguments filed 3/15/2002 have been fully considered but they are not persuasive.

The characterization of the cited references is noted.

The statement on page 4 of paper 10 that ELO techniques require the substrate and the underlayer to be of the same material is not corroborated by Davis col. 1 lines 40-45 where it is stated that AlGaIn can be grown on a GaN/AlN/SiC substrate.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). The argument that Davis teaches deposition by CVD is not persuasive in that the rejection is made with a combination of references. The equivalence of MBE to CVD for deposition has been established above. The optimization of the incident angle for MBE was also established above.

The argument that Nakamura et al. does not teach the preferable incident angle of the claims is not persuasive. Nakamura et al. discloses optimization of the incident angle within a range of 0-90 degrees. The applicant's range of not more than 40 degrees falls within this prior art range and is thus suggested in that art.

Conclusion

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew A. Anderson whose telephone number is (703) 308-0086. The examiner can normally be reached on M-Th, 6:30-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech can be reached on (703) 308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 305-3599 for regular communications and (703) 305-3599 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

MAA
March 22, 2002


BENJAMIN L. UTECH
SUPERVISORY PATENT EXAMINER
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